

Analysis of Strain Rate Profile Detects Segmental Systolic and Diastolic Left

Ventricular Wall Dysfunction Start from 50% Coronary Artery Stenosis

Purpose: We reported left ventricular (LV) segmental diastolic wall dysfunction starts from 50% coronary artery stenosis (CAS) at the ESC congress 2010. As it is thought that myocardial ischemia (MI) starts from 75% CAS, we conducted an animal experiment using pigs to confirm whether 50% CAS causes MI. The experiment revealed all of 50% CAS decreased both of coronary artery flow ($6.3 \pm 2.6\%$) and the segmental myocardial tissue oxygen pressure ($23.2 \pm 2.6\%$). The systolic function of the segmental LV wall was evaluated by using the strain rate (SR) function we created: $Z = 4.91 + 1.02 \times (100\text{-msec SR value}) + 1.23 \times (200\text{-msec SR value}) - 0.46 \times (\text{minimum SR value}) + 4.83 \times (\text{mean SR value})$ (R.

Kakihara, T. Suzuki With this function, systolic segmental function decreases as the value of Z increases. In the experiment, the normal coronary artery group (N-g) $Z = -0.59 \pm 2.6$ and 50% CAS group (S-g) $Z = 1.96 \pm 1.05$. There was a significant difference between two groups ($p < 0.0001$). After looking at this result we investigated the systolic and diastolic segmental LV wall function with 50% CAS of the human hearts whether they are dysfunction.

Method: Eighty-six patients who underwent coronary angiography and signed informed consents to this study were enrolled in this study. The 4 groups are consisted by CAS (shown the table below). To evaluate the segmental systolic function, The SR function

was employed as in the experiment. The results were compared by unpaired t test.

Results: To evaluate the LVsegmental systolic function, Z values were used. The results were shown in the table below:

Segmental LV Wall Function				
Stenosis	≤25%	50%	75%	90%≤
Num. of vessels	94 vessels	91vessels	26 vessels	43 vesssels
systolic function				
Z values	-1.7	-0.38	1.49	3.07
±	±1.41	±1.86	±0.75	±1.61
p		p < 0.001	p < 0.001	p < 0.001
diastolic function				
Peak E	1.75	1.34	1.13	0.21
±	±0.46	±0.61	±0.34	±0.48
p		p < 0.05	p < 0.001	p < 0.001
E/E time	17.23	10.11	7.28	6.67
±	±5.12	±4.57	±2.26	±1.86
p		p < 0.01	p < 0.001	p < 0.001

These results suggested the systolic and the diastolic segmental LV wall dysfunction started from 50% CAS (E time : time from the end-systolic time to peak E value time).

Coclusion: Based on these results of the study, systolic and diastolic segmental LV wall dysfunction were caused from 50% CAS in the human heart as same as the experimental results.